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HOW TO REDUCE THE GAS BILLS.

The ways in which gas bills may be reduced in most households are chiefly two: First, to avoid burning gas unnecessarily; and secondly, to see to it that the method of consuming is such that the largest possible amount of light is obtained from the smallest possible quantity of gas. By a little attention to both these points, most householders might very materially economise.

If the truth could always be known, it would often be surprising what an amount of gas may be absolutely wasted by allowing burners to flare away in places where they are wanted only very occasionally. In remote passages and bedrooms, in pantries and lavatories, and other parts of the premises, where a light may be required, perhaps, for a few minutes once or twice in the course of an evening, it is very customary to light up the gas at dusk, and let it flare away for hours. Of course it is very convenient to have every part of your premises lighted up. It is tiresome and provoking, if you want to go into a room for a moment, to have to find matches and light the gas; but to keep a number of gas-burners going all through the dark hours of the evening, all through the winter, comes expensive, even though they may be turned low when they are not in use.

For the avoidance of this waste there are two ingenious contrivances that have recently been brought into the market, either of which is well worth the attention of housekeepers. The first is what is called a 'by-pass' arrangement, by which a tiny jet of flame may always be kept burning, as a means of lighting up by merely turning on the gas, and without the application of a match. A light is then always ready when it is wanted, and the consumption of gas by the small auxiliary jet is hardly worth consideration. The one objection to it is that in draughty situations it is possible that the small jet may sometimes be blown out and the gas escape. The other device referred to is one to which it seems difficult to find an objection on any score whatever.

It is simply a little contrivance fixed to the side of an ordinary gas-jet in such a way that when the gas is turned on it impinges on a small piece of spongy platinum. The mere passage of coal-gas over this substance has the curious effect of rendering it so intensely hot that in a second or two it becomes a glowing white, and the gas, rushing over it, is ignited. The light may then be turned on and off just as readily as the electric light.

But what is even more important than the lighting and extinguishing of gas is the mode of burning it when it is alight. Every gas-consuming household necessarily has somewhere about the premises a 'meter' for measuring the gas supplied. The calculations of this mysterious piece of mechanism are often of an unpleasantly surprising character. If, however, instead of a gas-meter for measuring gas, every household had a photometer for the measurement of the light given by the gas, there would often be a revelation still more surprising. It is really very curious that we should, most of us, be so particular about getting the gas we are charged for, while, at the same time, we rarely trouble ourselves to insure that we are getting all the light the gas we pay for ought to yield us. If we have the least suspicion that the gas-meter is not doing quite fairly and squarely by us—that it is not working properly, and that it is registering against us five or ten per cent. more gas than we actually receive—we feel it necessary at once to take steps for remedying so ruinous a proceeding. But it is the commonest thing in the world for people to be burning gas that gives an amount of light five and twenty per cent. less than it ought to give without being in any way concerned about it. Sometimes, of course, it is because they are unaware of it; but even when they have to complain of a bad light, the only remedy they can think of is to turn on more gas; they rarely think to insist upon it that the gas they are actually using shall give them a better light.

'It is very absurd,' said the managing director of one of the great London gas companies, some

time ago, 'it is very absurd for people to make a fuss about an increase or decrease of a penny a thousand feet in the price of gas, when, if they would only take a little care, they might often reduce their gas bills by fifty or sixty per cent.'

Perhaps that was rather an extreme statement, but it was much nearer the truth than most people would suppose. A few years ago the gas referees appointed by the Board of Trade made an exhaustive inquiry into the efficiency of gas-burners in general use, and they found that some of them gave scarcely a fifth part of the light the gas would have given if burned as it ought to have been. The practical effect of that, of course, would be that consumers using such burners were paying at least five times as much for their gas as they need have done. Of every twenty shillings they paid away for gas, sixteen shillings was mere waste. These, of course, were extreme cases, but they found many kinds of burners yielding only half as much light as they should have done, and not a few in which the light was not more than a third or fourth of what it might have been. The referees reckoned that at a very moderate computation London thus paid half a million of money every year more than it need have done for its gas. That, however, was over twenty years ago. Some years later than that the gas examiner of Glasgow showed that that city similarly wasted at least £130,000 a year.

No doubt the pecuniary importance of the matter is now more generally recognised than it was then, and the proportion of waste is probably less. But that there is still a great amount of it is quite certain, and in households where no intelligent consideration is given to the matter it is often as great as ever it was.

Every housekeeper ought to know that a thousand cubic feet of gas of a certain standard quality represents so much light. The amount of light may be quite as accurately measured as the amount of gas, and with the necessary appliances almost anybody may measure it. For the majority of people this, however, is of course impracticable. They cannot do the measuring for themselves, but they may be quite assured that when scientific authorities state that a certain gas-burner gives only a half, or a third, or a quarter the illumination it should do, they are saying what is quite as easily proved as it would be easy to prove that a jug which should hold a pint of milk contains only half a pint.

The first thing to be done in the economical burning of gas is to get a good burner; but it ought clearly to be understood that it is not the only thing. The philosophy of the matter is extremely simple. The burning of gas is merely the chemical combination of the gas with the oxygen of the air. This combination is attended by intense heat, which makes the particles of carbon in the gas white hot. It is this glowing white of the carbon that gives the light. Now it is quite clear that the gas and the oxygen cannot combine unless they come in contact with each other, and the gas-burner is simply a little contrivance for bringing them into contact. If the gas blows out of an open pipe in an uninterrupted stream, it presents so little surface to the air that it cannot get oxygen enough to combine with. The carbonaceous particles do not get hot enough

to become white, and the light is red and smoky. If, however, the stream of gas is made to pass through a well-constructed burner, it is spread out in a fan-like form, presenting two large surfaces to the air, and thus getting plenty of oxygen. In some burners the gas issues through a slit which spreads it out to the oxygen. In others it comes through two holes in two small streams so arranged as to rush against each other, and the same effect is produced. But whether it is a 'bat-wing' or a 'fish-tail,' the purpose of either burner is the same—merely to spread out the gas to the surrounding air. In order to do this perfectly, the burner must be made with great nicety, and is always intended to consume a definite quantity of gas per hour. That is what so many gas-consumers do not know or do not consider. They may get the best burner that money can buy, but that in itself is not sufficient for economical use; a perfect burner requires a perfect gas-supply. If less than the proper quantity of gas passes through it, the flame does not get properly spread out, its carbon particles do not get properly white with heat, and there is a great falling off in the quantity of light afforded in proportion to the gas consumed. It may be true that only half the gas is being burned, but the probability is that a good deal less than half the light is afforded. On the other hand, the pressure of gas may be too great and more gas forced through than the burner is intended for. The difficulty in this case is not that the gas does not get sufficient exposure to the air, but that it gets too much. If it rushes through with too great a force, it sucks in more air than it can combine with; the excess of air cools the flame, combustion is imperfect, and the amount of light is less than would be yielded by a smaller amount of gas. There is more expense and there is less light. The falling off of the light is indeed the chief mischief, for whatever the excess of pressure may be the increase in the consumption of gas is proportionately only small. But if the gas rushes through with a swirl and a roar, more than enough air is drawn in, and the excess only serves to lower the temperature and reduce the light.

It will thus be seen that the economical burning of gas depends chiefly upon a nice adjustment of the supply of air to the supply of gas, and this is true whatever form of burner may be employed. The Argand burner is merely another device for effecting this adjustment in another way. The Argand is a ring perforated by a number of very small holes, and the glass chimney is applied as a means of securing just the right supply of air. If the burner be lighted without the glass and turned on to its full height, the gas will be insufficiently supplied with oxygen, and it will stream up in a long yellow smoky flame, consuming an amount of gas out of all proportion to the light given. By putting a chimney round the flame, a strong draught is created; the air is sucked up right through the flame. The higher the chimney the stronger will be the draught and the greater will be the supply of air. The chimney may be too high and the current too strong. As with the other burners the temperature of the flame will be lowered and the light reduced. If, on the other hand, the chimney be too short, the draught will be insufficient to feed the flame. The particles of carbon will not be of

a sufficiently white heat. They will not glow with sufficient intensity, and the light will be less than the consumption of gas ought properly to afford.

MY KAFFIR.

CHAPTER II.

IT was dark on the third day when we drove up to a comfortable-looking stone house, and received a warm welcome from Mary, who, I fancied, seemed more than merely pleased to see me.

When I rose in the morning and went out for an early smoke, the first object to catch my eye, just outside the garden fence of smart, white-painted palings, was the koppie—the identical stony, flat-topped hill of that long-ago trek.

It, as well as its surroundings, was changed. Many gaps and cuttings in its sides showed where the materials for the snug buildings around me had been procured. But for the white, three-cornered patch, plain, if not plainer than ever, I doubt whether I should have recognised it again. As it was, I knew that I could not be mistaken. I looked for the big tree, but saw no signs of it. Only the long velvety grass, and the so-familiar gum leaves on many saplings shimmering in the morning sun.

After a time, and with some effort of memory, I decided that, as nearly as possible, the spot on which the tree had stood was now occupied by a rustic summer-house, built in what was evidently the middle of Mary's flower-garden.

And then, as I caught the flutter of a white dress through a leafy alley-way of vines, I started in pursuit, and, for the nonce, once more consigned my Kaffir to oblivion.

Each day I stayed on at Draakenspruit the more deeply I felt that I must either win Mary Johnston or die a bachelor. And, as time passed, I flattered myself that, as the phrase goes, I was not wholly indifferent to her.

But I was afraid to speak. Her father was, I knew, one of the richest settlers in the Transvaal; owning, besides a couple of fine farms, many shares in some of the best mines on the Rand.

No, I must go away at once; and, somehow, by hook or by crook, do what so many were doing just then—find gold, and plenty of it. Then I might, without misgiving, return and claim Mary.

Forty pounds out of the one hundred had gone to Osborne in Melbourne, leaving a remainder in hand of about an equal amount. Clearly, I must depart before I made a fool of myself. And that I had sternly resolved on not doing. But when a pretty girl is one of the factors in a resolution, it is an utter impossibility to forecast events.

And, one evening, sitting in the summer-house, exactly over the spot where I reckoned my Kaffir's bones should be; the odour of orange blossoms heavy on the warm air, and the great white lilies outside looking like cups of frosted silver in the moonlight; things, somehow, fell out as I intended them not to do.

I had been telling Mary of my intention to

trek to the new diggings in Manicaland; and when I saw the sudden pallor steal over her face, and the look of pain and sorrow that crept into her dear eyes as she turned them upon me, I forgot all my self-imposed caution, and, there and then, awkwardly enough, I daresay, when I come to think of it, blurted out that I loved her, and her only of all women in the wide world.

And presently, she nestled closer to me and shyly confessed, in reply to much questioning, that, ever since that stormy day on board the steamer, when for a minute she lay faint and trembling in my arms, she had thought of no one else—nor, indeed, ever before.

And then I kissed her again, and told her that now, more than ever, I must leave her to search for fortune, knowing, as I did, that her father would never consent; and that what I was doing was altogether wrong; and that I ought to have known better. But she was so happy she only laughed, and said that her father could refuse her nothing—not even a hard-up digger-man.

I, however, was very doubtful; and when I heard the old man's voice calling us in to supper, I jumped like a fellow at the first touch of a cold shower on a day with the glass at one hundred and ten degrees.

That night I plucked up courage and told him I loved his daughter; and that there was nothing I wouldn't do to win her.

He listened smoking, and not interrupting. Then as I finished, he shook his head, and said, not unkindly, 'I'm afraid it won't do, lad. By your own account you've been wandering about the world, come-day go-day fashion, with sometimes a few pounds in pocket, and more times nothing. Now, s'pose I let you have Mary, how am I to know that, as soon as I am gone, that wild strain won't show up again, and make you shift your burdens till everything's frittered away? No, you're only a stranger yet—great as the service you've done us—and Mary's all I've got, and I mean to take care of her. But,' he continued, after a pause, during which I kept silence and strove to hide my chagrin at the exact justness of his remarks, 'if you honestly think you can steady down—why, I must admit that I like what I've seen of you very well—and there's the place over at Ermelo, you can manage that for me. I can't always be running back'ards and for'ards. I'll give you a hundred a year and found, and after a bit, why, we'll see. I don't think I can say fairer just now.'

This was, in reality, more, in every way, than I had any right to expect—was, in fact, a very handsome offer. But I was in a terrible hurry to make Mary my own at once, and the very idea of such a humdrum sort of waiting vexed my inmost soul.

Still I had the grace to thank him. But I'm afraid not very heartily; for he said, with a twinkle in his eye, 'Ay, lad, I was young once myself, and as hot-blooded, and strong, and impatient, but, at long and last I had to calm down. And a man can't rush his pile. You might trek away—(I had mentioned my notion of trying the new field)—t' other side of Mashonyland and prospeck for years and years,

and return, if you ever returned, a lot poorer 'n you started. The steady, constant worker's the one that gets home first, after all's said and done. I've found that out.'

All at once, as he finished, there flashed through me, like a mild shock from an electric battery, the old warning feeling that now or never was the time to look up my Kaffir. And, taking the risk of being laughed at, I told Johnston the whole story.

'Terrible romancers, Kaffirs,' commented he as I finished. 'And some of them would play a practical joke like that with their last breath. And there's one tribe that makes a practice of always cutting their dead open after death to let the spirit escape. Your friend may have had that notion in his cunning old head. Of course he possibly was telling the truth. But I doubt it. Ay, there was a big tree, I recollect, growing right in front of the house. I grubbed it to make more room in the garden. About three or four hundred yards from the koppie? Why, that'll be slap in the middle of Mary's flower-beds. You'll have to talk that matter over with her.' And he laughed, as he added, 'Never mind your Kaffir. Think over the offer I have made you just now. Take your time. And you'll get more by Ermelo farm than ever you will by rooting up poor Mary's flowers.' And the old man laughed again as he went off to his room.

Next morning at breakfast the subject cropped up again. Old Johnston had been thinking, and had made up his mind that the outermost branches of the tree would have just covered the lily plot, Mary's especial pride.

This, I believe, was meant purely as a joke on his side.

But Mary, who had been eagerly listening, at once insisted on a thorough search being made. Much more wonderful things, she vowed, had happened. Did we think that because the poor Kaffir was black he was therefore devoid of all gratitude? And dig I must. And if I didn't, she would. Lilies! What were they compared to diamonds the size of mealie-ears—and bigger! And she thought, too, that I was right and her father mistaken; for she remembered seeing a great stump once, where the summer-house now stood, when she came over from Ermelo, quite a little girl, shortly after old Johann Weenen sold the farm. So, partly to please my mistress, and partly to set at rest for ever that indescribable monitor, spoken of many times in this history, I dug in the bed of great lilies—dug them all up till they lay in rows of bruised and shattered loveliness on each side of the deep wide trench I made in the soft mould—with my trouble for my pains.

Pain would I then have desisted, but Mary would have me explore the floor of the little summer-house in which only last night we had talked of love.

So, to please her this time wholly, I dug in a half-hearted fashion, and old Johnston, laughing at the madness of the thing, went inside, followed presently by Mary to get a can of beer for her workman.

Three feet down in the stiff blue clay I came across something that made me ply pick

and shovel frantically. And by the time Mary and her father returned I was almost out of sight in a deep hole that nearly took in the whole floor.

'Good Lord!' laughed Johnston, 'you surely never planted him as deep as that.'

'No,' I answered, popping up. 'I can't find him, unless, indeed, his bones have turned into this stuff,' handing him, as I spoke, half-a-dozen specimens in which one had to look very closely to see the quartz—so thick was the gold.

The old man whistled loud and long, as he fingered them lovingly, and as scarcely able to believe his eyesight.

'So it's here,' he exclaimed at last, 'the lost lead runs they've been trying to trace from the Rand. Well, who'd have dreamt of such a thing! No farming now, I suppose. Eh, lad? Why, it's a regular jeweller's shop! And looks like dipping into the horse-paddock, too! No mistake about its being the true reef. My boy, I shouldn't wonder if you've dropped on to one of the best things in the district. And that's saying a good deal, let me tell you. Good old Kaffir! He did mean business, after all then, in a way!' And so did we! For before we finished the work begun that morning, Johnston and I took £25,000 each out of the claim, and then sold our interest for as much again. People over there still talk with respect of the rich Geldenberg Mine, although there have been heavier finds since, but nothing like at such shallow sinking.

Of my Kaffir not the remotest trace was ever found in all the turning-up the country presently got. Nor did I ever experience a recurrence of that strange feeling impelling me to go and look for him.

But, as Osborne says, who can doubt for an instant that his was the psychic force exerted in some extraordinary and persistent manner to bring to pass that dying promise of his: 'And on a day, not too far distant, it shall be very well with thee.'

And, as Osborne puts it again, who can doubt that my Kaffir made his reward take the form it did; because he presently discovered that, in the matter of the diamonds, I should be simply standing in the position of a receiver of stolen property. And we all agreed that it was very curious that this aspect of the case had never struck any of us before.

But I will scoff no more. For I am not quite sure that in this story I have rendered my Kaffir full justice. The question is really such a perplexing one that I have decided to leave it open.

Mary and I were married in Durban, and we took our honeymoon trip to Australia. We chose it for various reasons; but chiefly to bring the Osbornes back with us. They were to have the Ermelo farm as a gift from me.

Also I was taking Osborne a convert.

One evening, coming on deck, I found my wife watching the splendour of the swirling fire in the wake of the screw, boiling like a huge cauldron of liquefiant opals, and with a light by the glory of which one could see to read the smallest print.

For a while we silently gazed together. I

was thinking, for my part, of another night not so very long ago, when, from the other end of this same ship I sat and watched the jewelled water and called myself names for having ventured on a wild-goose chase.

Presently Mary slipped her hand into mine, and said, 'Jack, dear, I've been thinking.'

'Yes, my love?' I replied, with the due deference becoming a fortnight-married man.

'Yes, Jack,' she answered earnestly, 'and I've made up my mind to agree with your friend, Mr Osborne, that we owe all our luck and all our happiness to your poor old Kaffir.'

'But what is "psychic force," Jack?'

'My dear,' I said authoritatively, 'there goes four bells—time for you to go below, out of the night air, and turn in.'

MECHANICAL POWER FOR TRAMWAY CARS.

By an Expert.

THE question of getting some better means of traction for street tramway cars than that afforded by horses is one which even in this country is beginning to attract some share of public attention; and eyes are directed to America, where such vast strides in street-railway improvement have been made in recent years. Whether from the point of view of tramway companies or from that of the travelling public, what is wanted is a method of propelling the cars at a higher speed, which shall at the same time cost less in working expenses than when horses are employed. Having turned my attention for several years to this subject, and just returned from a visit to several cities in the United States where improved methods are in use, I may venture to give here some indication of the relative merits of different systems. There is the greater necessity for the British public now looking into the matter, as the country is on the eve of great changes in the domain of tramway motors. Of horse tramways we have had more than enough in this country. The inefficiency of traction by animal power, especially in severe weather, or on hilly routes, need not be dwelt upon, nor the fact that the working of the system is so expensive that very often little profit can be made out of it. Another discredited method is the use of steam locomotives. They have proved as expensive, and often more expensive than horses, and are such a nuisance in the streets that they have generally met with public disfavour. Many have been the experiments with gas, oil, and compressed-air engines; but none of these motors have yet come into general use. In most cases they have been found wanting, either mechanically or financially. In all such methods the power is generated directly on the car, and that being so, it is in the nature of things that the production of power should be more expensive than when the generation of energy takes place in a large, central station, and is distributed to the cars on the line. Every one knows that a multitude of small prime movers cost far more to run than one large engine generating the same power as the sum of the small units. Starting from this fundamental basis, the question is to

find a means of distributing the power from a central station to a large number of moving cars on the lines without incurring losses of energy in transmission as great as that arising from the use of separate prime movers for each car. The statement here to be made with all possible emphasis, and to be briefly explained in what follows, is, that such means exists, and has been demonstrated to be a thorough success. The two successful methods of applying to the cars the energy produced in the central power station are cable and electric traction. The former, being of older date, will first be touched upon.

Cable traction was first applied to street cars twenty-three years ago in San Francisco. On this plan, an endless steel wire cable runs upon pulleys in an underground conduit situated between the rails of each track, and it is continually driven at a fixed given rate of speed by engines and driving mechanism in a central power station through which it is deflected. There is a continuous slot in the surface of the street through which connection is made between the car and the ever-moving cable. The connection consists of a gripper which is a kind of a vice with one movable jaw. When the driver, by a wheel or lever, closes the gripper tightly on the cable, the car moves along at the same speed as the rope. If he grips the cable loosely, so as to allow the rope to partially slip through the jaws, the car can be made to move as slowly as may be desired. If he opens the gripper completely the cable runs free and the car comes to a standstill. At each end of the line or section of the line the cable is brought round from one track to the other by means of a large horizontal underground pulley. These are the broad principles of the operation of the system, and though they are exceedingly simple, a great deal of ingenuity and nicety of adjustment are required in working out the details. The cable system was adopted in San Francisco to enable cars to be worked up and down the very heavy gradients in that city, and one of the great benefits of the system is the fact that slopes of any steepness can be tackled. Indeed, it works even better on gradients than on the level, excellent as its performance is in both cases.

One great drawback which has prevented cable traction from extending even more than it has done in America is the fact that the construction of the conduit, especially where many underground pipes have to be removed, is an expensive matter. Another drawback is that if there are many sharp curves, the line is more expensive both to construct and to work than where it is approximately straight. In England and Scotland, however, we have several cable tramways built with a shallower conduit and with a different kind of curve construction, and these modifications have greatly minimised the above-mentioned hindrances. It is probable that there will be a considerable extension of cable lines on this improved method in this country. The first great step in this direction is now being taken in Edinburgh, where soon practically all the lines will be run on the cable system.

Regarding working expenses, the great feature of the cable system is that the more frequently cars have to be run, the lower the cost proportionately becomes. If the interval between the cars is very long, say a quarter of an hour, a cable line

is expensive to work, as a large proportion of the total power is expended in hauling the dead-weight of the rope. But when cars require to be run on a very short headway the amount of power expended increases comparatively little, and the losses in application through the agency of the grippers are very small. It has thus been found that, for a great city traffic where the interval between the cars is only two minutes or perhaps one minute, cable traction is the cheapest form of haulage known. The total working expenses in such cases may be set down for this country as at most fivepence per car mile run, which is only one-half of the cost on many horse and steam tramways. If the cars require to be run at longer intervals, say of from five to ten minutes, the cost per mile run is somewhat greater than that on a two-minute headway; but there is still a margin for larger profits than can be obtained from horse traction.

There are three methods of propelling cars by electricity, but only one of these has come into general use. The carrying of charged accumulators or storage batteries in the cars to supply current to the electric motors has often been tried, but the cost of maintaining the batteries has been found prohibitive. Another plan is to construct a conduit between the rails, similar to that for a cable, but equipped with electrical conductors, which are supplied with current from a central electric power station. The electricity is picked up by the car by means of a brush or plow which descends through the slot in the street, and slides or rolls on the conductors in the conduit. This plan is in successful operation at Budapest in Hungary, and at Washington and New York in the United States; but the first cost is very great, seeing that the expense of electric equipment of cars, &c., has to be added to that of the conduits. There is, besides, great difficulty in maintaining the insulation of the conductors in wet weather. There are also various designs of closed conduits with magneto-electro devices, but these have never passed the experimental stage.

The method which has come into such wide use in the United States, and is now spreading on the continent of Europe, is known as the trolley system. In this case, the electricity from the power station is conducted along the lines on continuous wires, which are suspended above the centre line of each track. These trolley wires run overhead twenty feet or so from the ground along the whole length of the tramway. They are suspended either from cross wires attached to poles erected at intervals on each side of the street or directly from poles with long brackets. The car has a trolley pole attached to the roof, and extending backwards and upwards to the wire, where it terminates in a trolley, or deeply-grooved wheel, which runs along the underside of the wire. Strong springs at the base of the pole hold the trolley firmly up against the wire. The current is led down the pole to the two electric motors, which are geared one to each axle of the car. By means of a controlling device the current can be switched on or off, and while the car is running a continuous supply of electricity passes from the wire, down the trolley pole, along the car wiring, through the motors, and then to the rails, which, along with auxiliary conductors, form the return

part of the circuit to the power station. Heavy feeder wires feed at intervals into the overhead conductor, and the joints of the rails are bonded with copper rods to secure a continuous return.

It is only eight years since the first practical tramway of this kind was laid in the United States, and now there are thousands of miles of such roads. The fact that the cost of construction, apart from the track rails, varies almost in proportion to the amount of traffic to be provided for, has allowed of the building of electric lines over quiet suburban and country routes, while its flexibility of application renders it suitable for tortuous routes, and the easy smoothness and rapidity of the car motion have found great favour with the public. Higher speeds than would be allowed in this country suit the system best, from an economical point of view; but even at low speeds it can be worked rather more cheaply than horse traction, while the improved service leads to an enormous increase in the receipts. The expensive form of cable tramway construction in the United States has cost enormous sums, ranging up, in the case of Broadway, New York, to about £200,000 per mile of street. The building of that line, however, necessitated the removal and reconstruction of the whole sewerage and gas and water-pipe systems under the street. In this country cable lines can be built and equipped, including everything necessary, for £20,000 to £25,000 per mile of street. Electric lines in either country, double track in all cases being postulated, may be built for a light traffic at £10,000 or £12,000 per mile of street; but for a very heavy service they will cost about the same as the British style of cable roads.

The working expenses of an electric tramway do not show, as traffic increases, the same great reduction in cost per mile run as is the case with the cable system. The reason largely is that the power developed at the central station is proportionate to the requirements of the service, and that the losses in the application of the power increase as the number of cars increases. It is no doubt true that a large system can be worked more economically than a small one, but the slow speed and traffic blocks in crowded streets are apt to tell considerably against electricity. In America the working expenses vary enormously in different localities, but in Britain it is probably safe to say that, on the average, they will not exceed sevenpence or so per car mile run. As on any system the receipts may be expected to be twopence or threepence per car mile higher, a reasonable margin of profit may be looked for.

The main objection to electric traction is the use of poles and the overhead wires in the streets. This is largely a matter of usage, and the people in America, who at one time bitterly opposed the system, are now quite reconciled to the existence of the wires, in view of the great advantages of easy and rapid transit. The danger of shocks from broken wires has been greatly exaggerated, and it is stated that nobody has ever been killed in this way. The pressure employed is 500 volts, and though this is often dangerous for horses, the human body is less sensitive. After all, a good, substantial, overhead construction kept in proper repair does not give way.

I found generally in America that there is great

public satisfaction both with cable and electric traction, and that in New York and Washington—the two cities in which the use of overhead wires is prohibited—the street-railway systems are not developed as they otherwise would be. It was also made plain to me that within the last two or three years there has been an enormous advance in the efficiency and reliability both of the generating machinery and the car motors. They are cheaper to buy, cheaper to work, and cheaper to maintain than formerly. Indeed, an electric car, fitted complete, can be bought for one-third less money than a few years ago, and it is the cars that cost in the equipment of an electric line for a heavy service. I heard everywhere of cases where street railway companies had enormously improved their financial position by changing from horse to electric traction, despite the necessary increase of capitalisation, and I was assured that the experience had been almost universal. This is very encouraging, because while the cable system has been an established financial success, for many years there has been much dubiety as to the outcome of electricity. Even now, however, it cannot be said that absolute knowledge of permanent financial results has been attained; but there seems no reason to doubt that electric traction will be of permanent value to the tramway shareholders, as well as to the general public.

People who have had no personal experience of cable or electric cars can have no idea of the convenience arising from the use of such methods of traction. Enormous traffic can be carried, and the lines can be led into districts where horse traction would be impracticable. Instead of a light, jolting horse car, we have a large, roomy, and comfortable vehicle of weight and solidity running smoothly, and at as high a speed as the law will allow. It is beautifully finished externally and internally, because every ounce of weight has not to be considered, as in the case of a horse car. At night it is brilliantly lighted either with gas or electricity; and a man can take a comfortable corner, and read his newspaper at ease. There is a great saving in the street space occupied, owing to the absence of the horses, and from the same cause the streets are much cleaner. No one in America would think of going back to horse traction on any account.

Hitherto the operation of the purchase clause of the Tramways Act of 1870 has prevented advance in the adoption of mechanical power for tramways in this country; but the purchases by local authorities now going on, and the renewal of leases in other cases, will lead to great changes within the next few years. After our chief towns have been supplied with cable and electric traction we shall be ready for the next step in advance, which has already been largely carried out in America. This consists in running the electric lines out into the country districts, and on to neighbouring towns. The system of a uniform five cent fare for any distance, which prevails in America, is causing a revolution in the life of city-dwellers, especially in that of the working-classes, because the people are enabled to live in healthy suburbs instead of in crowded tenements in the centre of the cities. I found generally in America that this desirable result was experienced; but whether we shall ever enjoy the benefits of the uniform fare in this country is doubtful. The

interests of the short-distance rider would be raised in active protest. Nevertheless, the uniform fare is one of the greatest social reforming agencies which America possesses.

A STORY OF THE HINTERLAND.

By the Author of *Rising of the Brassmen*, &c.

A GAUNT, rugged-featured white man, Charles T. Conditt, representative of an American syndicate of rubber manufacturers, lay sucking at a damp cigar in a swaying hammock, as his half-naked Krooboy bearers stumbled wearily along through the dismal bush of the Lagos 'hinterland.'

Dense columns of mist rose from the steamy lagoon beside their path, while between the forest and the stagnant water, what had once been putrefying ooze lay baked into the likeness of concrete slabs; for it was then the middle of the dry season of West Africa, and the sun shone fiercely down out of a sky of brass.

'Sing there; why don't you sing the "Acha ho," hammock boy?' said Conditt, for he knew that nothing will raise the drooping energies of the Kroobois like a song. Then the full-throated, marching chanty of the Kroo nation burst forth, and as the swinging chorus "Acha ho-hyah hallah hoh" rang out and echoed far across the misty forest, the weary bearers swung more briskly along beneath their load.

'Guess it would be safer on foot, but I'll risk it,' said the white man, as the Kroobois stepped out on the baked mud which lined the banks of a forest creek. Next moment there was a crisp sound like the breaking of thin ice; the feet of the leading bearer broke through the hardened surface, and he sank up to the knees in the slime beneath. Hammock-pad and palm-rib pole slid from his woolly crown, and the white man rolled out headforemost and came down with a crash, jamming his sun-helmet far over his eyes and his cigar half-way down his throat.

Finding all his bones intact, he sat up with his mouth full of ashes and disintegrated tobacco, and dragging it off by main force, ruefully regarded the flattened headgear. 'Should have known better than trust the mud. Gave a guinea for that thing in Lagos, and the dryest cigar in the lot wasted,' he said, as he kicked the useless helmet away. Then he turned fiercely towards the head Kroboy, who leaned against a palm-trunk with his hands upon his sides, and asked, 'What are you laughing at?'

'Ho, ho, ho,' roared the burly negro, with true African appreciation of a joke at the expense of some one else. 'Two time sah, the Lord give me sense too much. Savvy what say in we country. One time one fool, two time one d—fool.'

'The Lord gives precious little sense to any nigger. Take up the hammock—guess I'm safer on foot,' was all Conditt answered, and he limped forward, scraping the mud from off his face and clothes. Half-an-hour later there was a hoarse challenge from a grinning Yoruba sentry, 'Who

come dah ;' and as the white man advanced out of the shadow of the cottonwoods, a palm-thatched, wooden building, raised high on piles, became visible. A Maxim and a Nordenfelt gun peeped down from the broad veranda, and a black Yoruba soldier stood on guard at either side of the staircase ; for this was one of the chain of outposts erected here and there by the Colonial Government in the heart of the lonely forest.

As Conditt ascended the creaking stairway, a white man, whose thin frame and puffy cheeks showed that he suffered both from fever and too much alcohol, came out upon the veranda, and leaning against a pillar, relapsed into noiseless laughter. ' Been crawling after catfish in the mud ; nice amusement, but rough on one's clothes,' he said. ' No, you needn't frown, let me laugh ; it's not often one can in this land of the shadow.'

Jevons was right. There was very little amusement in his life, for he dwelt far apart from all white men in the steamy forest, trying to keep sane amid the awful isolation, and to avoid being poisoned by negro traders who owed him much palm oil for cloth and gin received. In short, he was one of those unfortunate traders to whom the name of ' palm oil ruffian ' was applied, and the species is not yet extinct. Presently, he raised his hand. ' Softly, softly, Musgrave's very sick at last. I can't make it out ; seems more like poison than fever,' he said. Treading noiselessly the two entered the darkened room, where with the perspiration standing in great beads upon his yellow forehead and streaming from his soaking hair, the lieutenant in charge of the station lay moaning in pain. When he saw the American the sick man's face brightened.

' So good of you to come, forty miles too, in this heat,' he said, ' and I am dull company anyway. Down at last, you see.'

' Well,' answered the American, ' if a man will work night and day, trying to keep peace among niggers who are never happy unless they're burning each other's huts, or stealing somebody else's wives, and go poking his nose into disease-stricken villages where he gets shot at for his pains, he must expect to have fever.' Then Conditt turned to Jevons, asking sharply : ' Have you sent down to the coast for a doctor ?'

' Yes,' was the answer. ' I sent two Yorubas a week ago. Musgrave wouldn't let them go at first ; said the Ilorin raiders would get them, so I packed them off at night. Fine fellows both ; wanted to swear by all sorts of things over a handful of salt that they'd go through at any cost.'

' Sent two Yorubas ! ' interjected the American wrathfully. ' Why didn't you send half the guard ? they'll be speared by now. I'd have written the secretary a letter fit to make him jump. Half my rubber-gatherers are dying with smallpox, three applications have been sent for help and drugs, and there's no answer.'

' Steady, steady. It's not good to get excited this weather,' said Jevons. ' Probably the drugs have been sent and the Ilorins have annexed them on the way up. The wily bushman is great on medicines, especially poisons.'

Then the sick man raised his head. ' My friends,' he said, ' you are both very kind. Jevons here has left his place when the new oil is coming down, the only profitable time of the year, and has nursed me ten days. Still, you must let me manage Government business a little longer. If they can get a Colonial surgeon through he'll be sent.'

The American poured himself out a glass of claret ; then he said : ' Christmas in three days— " peace on earth and goodwill towards men." Let's see how it figures out in Africa—cholera and smallpox clearing out half my people ; Musgrave very sick ; and the Bushmen ready to turn the place over our heads. Something wrong with the works, eh ? (Not very apparent, eh ?)

' You can't philosophise worth a cent, as you people say, you pessimist, but you can sing,' answered the sick man faintly. ' Take up the banjo—claret's not unlimited in the bush.'

The American lugged a dilapidated banjo from its case, and presently rapped out a few crisp notes ; then his voice rang out clear, and Jevons nodded approval as he sang of Sherman's march to the sea—a ditty commonplace enough, but one which, nevertheless, had stirred men's hearts before that day. When the words ' From Atlanta to the sea ' died away, he said quietly, ' I was there too—makes me feel an old man ! I spent another strange Christmas that year, in bitter frost and deep snow, with neither boots nor blankets, and precious little to eat. However, perhaps this is more appropriate ;' and the clear voice rose in the chorus of ' My heart's turned back to Dixie and I must go.'

Then Jevons said : ' Reminds me of home too, and the last Christmas I spent before I came out here and learned to fall back on the whisky-bottle in the awful loneliness. There was white frost on the fir trees, and black ice ringing beneath my skates, as, with a smiling girl upon my arm, I swung along upon the outside edge. Poor Florence—she's dead now, and I'm a drunken African trader. But no man can escape his fate, as the Yorubas say. Hallo ! Musgrave's asleep.'

Conditt threw back the persianos, and a flood of crimson light shone upon the hollow cheeks and closed eyes of the sufferer, as the sun sank behind the cottonwoods. ' I'm afraid the poor fellow will go under,' he said. Then a big Yoruba sergeant came noiselessly in, and after a brief glance at the drawn face, remarked when he moved towards the door again, ' White man sick, too much, live for die three day.'

' Get out, you black croaker,' was the reply of the irate American, and the soldier ducked his head as a whisky-bottle whizzed past him, and hastily descended.

' Useless waste. Come out on the veranda,' said Jevons ; and the two leaned over the balustrade. A deep voice was speaking below, in the Yoruba tongue. ' The white man is sick unto death, and he is a just man, and a valiant soldier. It is in my mind, that if it be the will of Allah, we may save his life, for the Feddah of the heathen are wise in the poisons of the forest. Had it been the trader man, who is gross and drunken (here Conditt chuckled and nudged Jevons), or the thin man, w.o., like the black monkey, never rests, and whose words come through his nostrils (this time Jevons laughed

softly and the American frowned), it were not worth the risk.' Then there was a hurried consultation below, and presently the big sergeant went away.

'Gone for salt to swear more ridiculous oaths,' said Jevons; but the rattle of arms interrupted him; and presently six Yorubas slipped away into the misty forest, the last of the sunset light flashing upon their Snider barrels.

Conditt whistled softly. 'There'll be unlimited trouble now; but they wouldn't come back for us. Besides, it's not good to interfere in the business of the British Government,' he said.

One night march through an African forest greatly resembles another, and Sergeant Amaro and his men alternately waded knee-deep in scented lilies, as they traversed the misty avenues beneath the palms, or stumbled blindly through dripping bushes and matted creepers. At last, splashing up out of a shallow ford, they crept like flitting ghosts amid the dark shadows of broad-leaved bananas, and halted before palm-thatched hut, outside a native village. Two tall wands stood before the doorway, hung with tassels of rags, stained red in blood which was probably more precious than that of fowls; while from the fronds of the palm that rustled drily overhead hung strings of fetich charms—many of them ghastly ones, including various portions of human anatomy.

A ray of misty moonlight fell upon the face of the Yoruba sergeant, and it was hard and set as he raised his hand for silence, and, drawing his bayonet from its sheath, went softly forward with the keen steel flashing in his hand. The soldiers waited breathlessly, their fingers tightening on the rifle-stocks as they gazed, now at the gloomy interior of the hut, and now at the sleeping village which lay before them, dim and shadowy, the silence which hung over it broken only by the howling of a restless cur baying the moon.

Then there was a smothered cry inside the hut, a brief struggle, and the sergeant came forth again, pushing before him a decrepit old man, upon whose shrivelled chest hung strings of curious charms, leopards' claws, human finger-bones, and the like. The captive struggled fiercely, hit at the hands which held him, and would doubtless have howled lustily, but that his mouth was filled with a ball of palm fibre, until the Yoruba shook him so that the charms rattled, and held his bayonet-point to the naked breast.

'The magic of the heathen may not hurt the true believer, Allah be praised,' said the sergeant softly. 'Nevertheless, it would not go well with us if the sleeping bushmen found our hands upon their priest—there is need of haste.'

So, glancing back over their shoulders towards the silent village at every step, and grasping their rifles tightly, the Yorubas strode through the ford just as gray dawn broke across the forest.

'If we would save our own lives as well as the white officer, we must travel fast this day,' said the leader; and knowing that their only chance of safety lay in reaching the station before a horde of savages, armed with matchet and flint-lock guns, followed hard along the trail of bent grasses, they pressed fiercely onwards, tearing through thorny thickets—cruel, stabbing thorns that rent their flesh and garments alike—disre-

garding also the saw-like edges of the sword grass, and wading alligator-haunted creeks, in peril of being smothered in depths of bubbling slime.

It was high noon when, worn out and tattered, plastered with mud, and bleeding from many a wound, the Yorubas marched into the sun-scorched compound. The two white men hurried down the veranda stairway, and gazed in astonishment at the sight.

'General Jackson! Where did you get him? What is he, anyway?' gasped Conditt, as his eyes fell upon the panting soldiers and the half-naked form of the prisoner, who gazed about him with venomous hatred in his eyes.

'Be great Ju-Ju, sah. Savvy much medicine. Stole him, sah;' said the sergeant proudly.

Jevons burst into a hearty laugh as he answered, 'By jove, Amaro's right. There's not a plant in all the forest whose properties the fetich priest doesn't know all about, though they generally make a bad use of them. These fellows learn things handed down through many generations, and if Musgrave's been poisoned, ten to one he can cure him.'

'H'm, a little risky, isn't it?' answered the American. 'However, the poor fellow's dying anyway, and it's a last chance. Come along, Mephistopheles—bring him by the neck, sergeant.'

Two minutes later the unfortunate fetich priest was dragged unceremoniously into the room, where Lieutenant Musgrave lay unconscious with only a faint, fluttering breath issuing from the cracked and blackened lips to show he was alive.

'Poor Musgrave, I'm afraid it's all over with him,' said Jevons. 'He did his work like a man, and he's well out of it—no more loneliness and fever. I don't know that I'd thank any one to save me; however, we'll try. Here, you black wretch,' and as he dragged the Ju-Ju man forward, one of the Yorubas tried various dialects, but failed to make him understand. Then Jevons, pointing to the pallid face before him, plucked a leaf from a flowering lily and bruised it in his hands. Instantly, a look of fiendish malice flashed into the negro's face, and the white man shook him like a rat, gasping 'You murdering villain.'

'Go slow before you choke him. I know a better pantomime than that,' said Conditt, and closing his eyes he let his head droop slowly forward, and made as if he would sink to the floor. Then he jammed the muzzle of his revolver against the sable forehead, so hard that the steel left an indented ring when he raised his hand.

'Scene one: now for scene two. Open the stores, sergeant, and bring up all the cloth you can carry,' he said, and as the Yorubas piled up the long rolls of Manchester cotton, he lay down near the sick man, and slowly rose upright; then he pointed to the cloth. The negro's eyes glistened. 'Go on,' said the American, 'more cloth; throw in cases of gin and a long-dane gun or two.'

At last, when he saw wealth enough before him to make him rich for life, the Ju-Ju man pointed out through the open casement towards the sombre forest.

'Wants to gather herbs,' said Jevons, and the American answered 'Good; but where he goes I

go along too, in case he forgets to come back, or brings his friends upon us. I've seen that game before. Follow with two men, sergeant.'

So, with a Yoruba on either side, and the muzzle of Conditt's revolver a foot or two behind the back of his head, the Ju-Ju man moved to and fro beneath the palms, and when he returned, loaded with various parasitic plants and fungoids grubbed up out of the slime, it was falling dusk. A big fire was lighted in the compound, and while the Yorubas watched him, rifle in hand, the Ju-Ju man bent over a bubbling rice cauldron, crooning a monotonous song.

Meantime, the sick lieutenant lay still and white, until as the moon rose above the cottonwoods, and the pale light streamed in upon his drawn face, he broke out into moans of pain.

Jevons shuddered. 'Poor fellow,' he said gently. 'A ghastly Christmas eve—virtue rewarded. This is what a man gets for doing his work too well. It's more like a scene from an opera than a Government outpost in the nineteenth century; that wretched nigger makes me shiver, or else I'm sick too; he looks like the evil one himself,' and he pointed to the moonlit compound.

Conditt glanced at the shrivelled figure of the Ju-Ju man flitting to and fro about the cauldron, with the red light of the fire upon his wicked face, while the monotonous song or incantation rose through the rolling smoke. 'Pray on old man, and pray hard, for, by Jupiter, if your gods are deaf, or the magic works the wrong way, I wouldn't give a red cent for your life.'

Presently the negro entered the room, and foreing apart the clenched teeth of the sufferer, poured a steaming liquid down his blackened throat; then he bathed forehead and breast, and afterwards chafed all the limbs with a hot fomentation. This done, he seated himself cross-legged on the ground, and waited motionless by the sick man's couch, until it was time to repeat the proceeding, which he did at intervals. The soft radiance of the tropic moon, streaming in through the open casement, threw a long black shadow of the crouching magician across the white boards. The odour of kerosene from the dimly-burning lamp, and of rangoon oil from the arm rack, was heavy on the air, save when a fitful gust of wind wafted in the scent of lilies from the surrounding forest; and there was no sound to break the oppressive stillness save the mournful sighing of the night breeze, and the intermittent rustle of the palm fronds. So the three strangely-assorted watchers sat in anxious suspense as the long dark hours dragged slowly by, Jevons whispering to his companion now and then in low tones as he felt his weary eyes grow heavy; but Conditt's hand never left his revolver butt, and though this was the fourth night he had passed without sleep, he kept his gaze steadfastly on the sick man's couch.

At last, shortly before dawn, the Ju-Ju man rose to his feet, and when Conditt hurried across with the lamp in his hand, he pointed triumphantly to the sufferer, and the American noticed a flush of colour in the pale cheeks, while a profuse perspiration streamed from every pore.

'Thank heaven,' he said quietly, and grasped Jevons's hand, but the negro placed his fingers upon his lips, and repeated the draught. Pre-

sently a faint, gray light filtered into the room, and Lieutenant Musgrave opened his eyes and gazed vacantly around; then, raising his head, he murmured, 'The pain's gone. I must have slept. I'm very sleepy now,' and again, as the heavy lids came down, he lapsed into peaceful slumber.

'He'll do now—and it's Christmas day. Bravo Mephistopheles,' said Jevons, and he smote the Ju-Ju man on the shoulder; then hearing a creaking of the boards and a heavy breath behind him, he turned suddenly and saw the tall sergeant gliding softly from the room.

A few hours later Lieutenant Musgrave lifted himself feebly on one elbow, and sat up with Conditt's arm round his shoulders. 'I am very weak, but my head is clear, and my blood is cool. What I suffered yesterday was awful, and I could not speak,' he said. Then he listened with brightening eyes to the story of the midnight raid, and when Sergeant Amaro came in with a bowl of steaming broth, his face twitched as he said in the vernacular, 'The Yorubas are very faithful. I was very near unto death, when they brought me aid.'

'Allah has preserved the life of the white officer, for his time has not yet come,' said the Moslem soldier gravely, and drawing himself up proudly, he added: 'As for the thing we did, it is nought, for the white officer and the Yorubas have fought side by side. We are brothers of the sword, for I too am a servant of the White Queen, and all men are the same beneath the skin.'

'Yes, I suppose so. There's certainly both devotion and courage in the heart of a negro when you know how to get at it—but I'm too happy to go into conundrums of that kind,' said Conditt. 'You know their tongue best, Jevons; tell him he's a fine fellow and a good soldier. I was a soldier too, though I do move about like a black monkey, as he was kind enough to observe, and I am proud to shake his hand,' and easing down the lieutenant tenderly into the pillows again, he gripped the black fingers of the Yoruba until the joints creaked.

Presently, on the principle that it is wise to let well alone, they sent the Ju-Ju man forth with as much treasure in cloth and guns as two stout Kroomen could carry; and the American observed grimly, 'If the headman of the village is at all covetous, Mephistopheles there had better lie close in his hut in dark nights, or he may have the efficacy of his charms severely tested.' Hour by hour the lieutenant's strength came back, until at noon, though weak and languid, he lay in happy content, listening with smiling eyes to the gay salutes of his companions, for now a reaction had set in.

By-and-by they heard a distant rustling in the forest, and the tread of marching feet and a jingle of arms came down the listless breeze, and later the cottonwoods echoed with the hoarse shouts of Krooboy bearers, who saw the end of their journey in view. Then a carrier train swung into the dusty sun-scorched compound, a line of half-naked negroes, each one panting beneath the heavy deal case he bore poised on his woolly head; while behind them a guard of Yorubas marched out of the shadowy forest. A young white officer gave the word 'halt,' and as the tired troops came to a standstill, a stout little man crawled out of

his swaying hammock. The young lieutenant—he was but little more than a lad—grasped the hands of the two white men who hastened to meet him.

‘Got through all right, though we’re every one about used up,’ he said. ‘We marched night and day, for we heard you were all sick up here; and came across a party of Ilorins on the war-path, but they bolted at the sight of the bayonets. Brought you up the English stores from Neville, too, and the best doctor we ever had; got him from the Protectorate people. Let me introduce Surgeon Wreath. How this day and night marching in the tropics does take it out of one!’

The listeners laughed. They knew the young officer would get used to it before he had been long in Africa, and they entered the residency together. Now the fever had spared Surgeon Wreath to dwell some time in the land, and the hidden things of native life were a favourite study of his. Therefore, when he had carefully examined the patient, he listened very gravely to the story, and answered: ‘I’ve been too long in Africa to despise the Ju-Ju man. He knows a good deal, though he occasionally makes a bad use of his knowledge, and I’d have given six months’ pay to have seen my black rival at work. You’ve had fever, Lieutenant Musgrave, and you’ve got it now, a little; but there was poison or something else, which I’m not quite sure about at the moment. Meantime, you couldn’t be doing better.’

‘Now,’ said Conditt, ‘it’s Christmas day, and there’s hard work before us to-morrow. All concerned having done their best for the patient, according to their opportunity, we have a right to enjoy ourselves if noise won’t hurt him.’ The surgeon shook his head, the new stores were brought in and opened, and presently, raising himself feebly from his pillows upon one arm, the lieutenant held a glass of sparkling champagne in his trembling hand, and gave the toast, ‘Her Majesty the Queen—God bless her.’ Afterwards, they raised their hands, and standing on tiptoe, clinked their glasses against the rafter beams as they drank to ‘absent comrades;’ then the American said, ‘Here’s to Sergeant Amaro—a valiant soldier and a very faithful servant, if his skin is black—as he says, “all men are brothers beneath the skin.”’

And so, in spite of the shadow of the pestilence which hung over one and all, and the heat and steam of the swamps, these dwellers in the lonely forest held their Christmas in far-away Africa with laughter and mirth; each one glad at heart, with a vague consciousness that, as the American put it, he too, according to his opportunity, had done a little in the cause of ‘peace on earth and goodwill towards men.’

Outside, the westing sun sank slowly towards the forest; puffs of hot wind licked up clouds of red dust and whirled them across the compound; the palms rustled drily, and the thermometer stood at considerably more than ninety degrees in the shade. Inside the darkened room, the hearts of both officer and trader went back across endless leagues of rolling water to the distant homeland, as they sang the songs of Britain with sparkling eyes and stirring blood in a strange and dreary land. Then the sun dipped behind the forest, and all the world was dark, until at length a

silvery light filtered down through the palm-fronds, and the stirring of the forest creatures showed that it was time for beast to hunt and man to sleep. With a hearty handshake all round, the men retired to rest, and save for a faint light where Sergeant Amaro watched by his master’s bedside, the residency lay dark and silent.

CURIOSITIES OF RENT.

THERE is perhaps nothing very attractive to the general reader in the mention of ‘Rent;’ but when we come to consider the quaint forms which it has often adopted, the subject will not be found wholly devoid of romantic interest. In days gone by, when kings had perforce to maintain a large crowd of retainers, and nobles vied with each other in the numbers of their retinue, it was not always easy to find the wherewithal with which to carry on the provisioning of such large households; and so landlords, royal and otherwise, were often glad to accept useful commodities, such as the herrings of Yarmouth or thirteen hundred eggs with one hundred and forty hens from Banbury, in place of the usual military service due to them for different estates. In other instances the tenants bound themselves to perform certain necessary offices for their overlord’s household, as in the case of Emma de Hamton, whose duty it was to cut out linen clothes for the king and queen, or Robert Testard, who had to maintain a certain number of royal laundresses. A third class of tenures consisted of those which were practically nominal obligations, such as the presentation of a ‘quhyt feather’ for the lands of Balgonie, or a July clover flower for an estate in Hereford, or again the three peppercorns which were paid in 1348 for Bermeton. Nor was this practice confined to our own shores. A dying Queen of Hungary bequeathed a city and province to one of her court lords on condition that he and his successors should always keep up a certain number of peacocks; and the chroniclers of the Spanish conquest of Mexico tell us that the great Aztec nobles were often obliged to provide for the repair of the royal palaces, and to pay an annual offering of fruit or flowers in lieu of the military service due for their estates.

The earliest mention of blanch-holdings (so called apparently from the fact that they were often paid in silver or *white* money) which I have been able to discover is in a charter by Canute, who granted the lands of Pusey, Berkshire, on condition that a certain horn was always treasured in the family, and this valuable heirloom bore the following inscription:

Kyng Knowde geve Wyllyam Perose
Thys horne to holde by thy londe.

These tenures appear to have been frequently granted from the time of the Norman Conquest to the fifteenth century, but we find an occasional instance occurring from that date almost to the present time. Visitors to the beautiful chapel of St George at Windsor will have seen the two small silken banners which are fastened together on one of the pillars, and represent the rent paid to the crown by the Dukes of Marlborough and

Wellington for the splendid estates of Woodstock and Strathfieldsaye respectively. They are supposed to be presented on the anniversaries of the battles of Blenheim (fought on the 2d August 1704) and Waterloo (18th June 1815).

On the abolition of ward holdings under George II., all the lands which were formerly held by the crown were converted into blanch-holdings, but as there appears to have been a generally understood rule that the obligation of performing any specified duties should lapse if not demanded within a given time, the greater majority of these curious old customs have disappeared. So late, however, as the coronation of Queen Victoria, an interesting service was performed by the lord of Worksop Manor, to whose predecessors Henry VIII. had granted that estate in 1542, on condition that they provided a right-hand glove for the king at his coronation, and supported his arm on that day so long as he should hold the sceptre. This right was inherited by the Duke of Norfolk, who officiated in 1838.

Another long surviving custom dating from the time of Edward III. was observed about four hundred years later when the owner of Liston, Essex, presented George III. at his coronation with a number of wafers, and on the same occasion the king received a bowl of porridge from the tenant of Addington. It is interesting to note that this estate was granted originally to Tezelin, a cook, by William the Conqueror, and it has been supposed that the manor in question was an appendage of the king's cook, as Sheen was of the royal butler. This explains the origin of the duty imposed upon the tenant of making porridge on coronation day.

We find interesting traces of the habits of the times in the service demanded from William de Alesbury, who held lands in Buckinghamshire, and bound himself in return to find straw for the king's bed, and also for the floor of his room, if ever he should chance to visit Alesbury in winter. Three eels were also to be paid at the same time. Should the royal visit take place in summer, straw had again to be provided for the bed, but grass or rushes for the floor, and two green geese instead of the eels. These services were only to be performed twice a year, even should His Majesty pay three visits in that time. For the fortunate family of Wilmington (who were descended from Robert de Wilmington, a cook to the Earl of Boulogne) in Kent, rent day must have been more honoured in the breach than in the observance, as they were only asked to find a pot-hook for the king's meat whenever he chanced to visit their manor. Rather a trying office fell to the lot of Eba, Countess of Warwick, who in return for the lands of Hokinerton, Oxfordshire, had the doubtful honour of carving at the table of Edward I. on his birthday, but she was graciously allowed to keep the knife which the king used, as a souvenir of the occasion. John de Rockes of Winterslow, Wilts, must also have felt a responsible person, as when the sovereign happened to visit Clarendon, it was ordained that De Rockes should come to the palace of the king, 'and go into the buttery, and draw out of any vessel he should find in the same buttery at his choice as much wine as should be needful for making a pitcher of the claret which he should make at the king's charge, and that he should

serve the king with a cup, and have the remainder of the wine after the king had drunk, and the vessel.'

Among the blanch-holdings which existed in Scotland are the following: A red falcon and a tercel for the thanedom of Glamis; two falcon hoods for the barony of Muirhouse, Edinburgh; three broad arrows for Lochindorb, described as a good centre for hunting; the Dewar lands in Glen Dochart, held in virtue of custody of a relic of St Fillan; the barony of Penicuik for blowing six blasts on a horn on the 'moor of the burgh of Edinburgh' when the king should hunt there, and the barony of Carnwath, whose owner was enjoined to present two pairs of shoes, each containing half an ell of English cloth, to the man who was first in a race from the east end of Carnwath to the Tallow Cross, this to take place on Midsummer Day. The estate of Foulis was granted to Donald Munro in the eleventh century by King Malcolm II. upon the condition that when called upon to do so, he and his successors should always supply the king with a bucketful of snow, no matter at what time of the year this was demanded. But the lords of Foulis had no cause to be uneasy as to the fulfilment of their part of the bargain, for did they not possess a part of Ben Wyvis on which the sun never shone, so that snow remained there all the year round? The service in question was performed for the last time on the night before the battle of Culloden, when it is said that Sir Robert Munro presented the Duke of Cumberland with a bucket of snow for cooling his wine. It must have been rather more difficult to obtain the garland of roses at Christmas time which was demanded of the tenant of Crendon, Bucks, but the thousand clusters of nuts for John, Earl of Warrenne and Surrey, would be gathered in due season at Wakefield.

It is curious to find Henry IV. requiring a catapult (described in an old chronicle as an ancient war-like engine to shoot darts) in exchange for the lands of Carlton; and there is a quaint flavour about the terms of the holding for a manor in Salop, by which Robert Corbet bound himself to find one footman in time of war who was to follow the army into Wales, carrying with him a salted hog. On coming up with the soldiers, the man had to deliver a share of the bacon to the king's marshal, and so long as this sufficed to provide a daily dinner for one person, the footman was obliged to remain with the army. Directly it was finished, he was free to return home. Sir Osbert de Longchamp also undertook to follow the king and his army into Wales, and it is specified that he must bring with him horse of the price of six shillings, a sack of the price of sixpence, and a needle to the sack. The footman, provided by the tenant of Brineston, was only required to follow the army into Scotland, but had to do this barefoot, and armed only with a bow in one hand, and an unfeathered arrow in the other; and he was altogether worse off than Richard Miles, who could return from following the king directly he had worn out a pair of shoes of the value of fourpence.

A grand old mansion in Cheshire, rendered famous in our own time as being the residence of a great living statesman, was formerly held by Robert de Montrault, Earl of Arundel, for the

somewhat easy duty of attending the Earl of Chester on Christmas Day at Chester, and placing the first dish upon his table ; while an ear paid for the estate of Grange near Hastings, and even this was only demanded when the king happened to sail in that direction. Many tenants fulfilled all obligations by keeping hounds or falcons for their landlords, while others shod the king's horses (and had to replace those which were lamed in the process) ; but it is difficult to understand the exact significance of one old record which says that Hugh de Sotthoe held the lands of Shottesbrook in the time of Henry II. by virtue of finding *coals* for making the crown of the king and his royal ornaments. Were these the original black diamonds ?

Even crowned heads were not exempt from the conditions of tenure ; for we find that at one time the king of England accepted three hundred pounds of land down from the king of Scotland in lieu of homage for some land in Bedfordshire, and also paid an annual rent of one *jerfalcon* (one of the varieties of large Arctic falcons). A pound of land, it should be mentioned, is generally reckoned at about fifty-two acres, so the commutation was a very substantial one. A somewhat similar holding to the barony of Penicuik was that of the Manor of Horton in Yorkshire, whose tenant was required to blow a horn at stated periods, and I believe that the horn used on these occasions is still carefully preserved. Such holdings were called 'hornblow lands,' and 'wolf hunt land' was the term applied to some crown property at Mansfield Woodhouse, Notts, which was granted by Henry VI. to Sir Robert de Plumpton in return for his blowing a horn, and chasing the wolves, then fairly plentiful, in Shirewood (now Sherwood) Forest. The land so granted was one *bovate* or *oxgang*, which is about fifteen acres, that being taken as the amount which one ox can plough in a year, and the surname 'wolf-hunter' was to be met with in the district up to the end of the last century.

In some cases a property carried with it the duty of holding a certain office in the state, as for instance in the case of Scrovelsby in Lincolnshire, which was for generations the home of the Dymoke family, who for many years regularly provided the 'champion of England' at coronation time. We will all agree with the eminent lawyer Coke, who says that the worst tenure of which he had ever heard was the obligation of acting as public executioner. There is an amusing note to the *Ingoldsby Legends*, in which the author states that Jehan de Ketch acted as Provost Marshal to the army of William the Conqueror, and received from that monarch a gift of land known by the name of the 'Old Bailie' on regular payment of 'ane hempen cravate,' but as a matter of fact I may mention that the name Jack Ketch was applied to hangmen from the time of Richard Jaquett, to whom the manor of Tyburn once belonged.

Lord Grey de Wilton's crest is a *jerfalcon* *sejant* upon a glove, which is a reminder of the days when his ancestors held the lands of Acton, Buckingham, in exchange for keeping one of these birds for the king ; while another reminiscence of ancient times is found in a clause which occurs in the leases of the tenants on the estate of Wallingwells, Notts. This clause demands that no

attempt shall be made to grow *woad* on the landlord's ground, and the injunction which dates from hundreds of years back is maintained to the present day, as is also the obligation on the farmer's side to do so many days' work with cart and horses for his landlord as part payment of the rent. 'So long as grass doth grow and water doth flow' is the poetical form taken by a lease of some land in Lancashire ; and Adam de Oakes escaped with an equally light obligation when he undertook to pay a halfpenny a year for Pinley, Warwick, to Edward II. As the purchasing power of money was four times its present value in the Stuart times, we must allow for a still more ample expansion at the beginning of the fourteenth century, but in any case the payment was comparatively trifling.

Though the march of progress has brought us countless unmixed benefits, we must sometimes feel a touch of regret that it has also swept away many picturesque customs which were formerly in vogue, and among these we must certainly include the quaint duties and ceremonies which constituted payment of rent, an obligation which in our day has been reduced to a prosaic, if more practical, matter of pounds, shillings, and pence.

THE MONTH : SCIENCE AND ARTS.

DR NANSEN's recently published narrative of his marvellous Arctic expedition, which has been so rich in scientific results, brings before the reader, in a more graphic manner than has ever before been done, the terrible nature of the ice-pressure which forms the chief danger to navigation in such high latitudes. It was quickly discovered that this pressure was dependent on the tidal current, the ice parting and packing together again twice in the twenty-four hours. The ice piled itself up and crashed against the sides of the good ship *Fram* with a noise so great that the voyagers could not hear themselves speak ; and the vessel was often lifted up several feet, to drop back again as the ice parted. Still more terrible was this pressure of the ice in the winter-time, when the *Fram* was frozen hard into a solid mass of ice thirty feet in thickness. On the top of this sea of ice came immense masses, 'gliding with irresistible force against our port side. The pressure was tremendous. The ice piled itself up above the gunwales and high up the rigging, threatening, if not to crush her, at least to bury her.' But the *Fram* was so strongly and well built that, although she creaked and groaned under the rough embrace of the ice, not a single crack was made in, or a single splinter detached from, her strong sides.

The Turners' Company, which was the first of the great City guilds to recognise that the best remedy for foreign competition in our markets was the spread of technical education at home, has recently held its annual exhibition of turnery at the Mansion House, London, under the auspices of the Lord Mayor. Thirty years ago, when the first of these exhibitions was promoted,

the sole articles sent in for competition consisted of a fishing-rod and a rolling-pin. Now a large number of workmen send in the products of their skill, encouragement being given to useful rather than ornamental articles. The first prize was, for instance, awarded to a set of stair balusters, which exhibited much ingenuity in construction and beauty of design; and it was noteworthy that the work was done by the hand alone, without help of slide-rest or other mechanical aid. This applied to most of the exhibits, which were the result of simple gouge and chisel work. Many of the great City companies have followed the course originally adopted by the Turners' Company, and have been instrumental in establishing technical schools where first-class instruction is given, and from which we may confidently expect first-class workmen to emerge.

Much has been said, and, we fear, very little done, with regard to saving the big game of South Africa from extermination; but it would seem, from a report on the German colonies by an official of the British Embassy in Berlin, that at last a check is to be put on indiscriminate slaughter. A regulation has been drafted with regard to game in German East Africa, which will oblige every hunter to take out an annual license, for which the fee varies from five to five hundred rupees, according to the particular animals hunted. No license will be required for shooting animals for food, or those damaging cultivated land, nor for beasts of prey, wild boars, reptiles and birds—with the exception of ostriches and cranes. The shooting of all young game is absolutely prohibited. Game sanctuaries are to be established, in which no shooting whatever will be allowed without special permission, and these districts are to extend in each direction at least ten hours' journey on foot. Suggestions are invited with regard to various points. Mr Gosselin, to whom this report is due, believes that the best method of preventing the extermination of the elephant would be to fix by international agreement amongst all the powers on the East African coast a close time for the animal, and to render illegal the sale or exportation of tusks under a certain age. But this regulation would have to be firmly carried out along the entire coast; for if the control in any one colony were lax, the illicit ivory would gravitate there, and the African elephant would not benefit.

In the recent report of the Fire Brigade Committee of the London County Council, the curious fact is noted that the number of false alarms of fires shows a steady increase. Three false alarms were actually recorded in the course of one morning, inflicting an amount of trouble and work upon the men which was as exasperating as it was unnecessary. It is extremely difficult to comprehend the state of mind which can induce any one, out of mere wanton mischief, to give all this needless trouble, and still more extraordinary is it that these mischievous persons will actually pay for the telegrams which in many cases convey the false news. Whether this be the act of madmen, or of pickpockets who hope to profit by the assemblage of a crowd, some means should be found to stop these false alarms, and every well-wisher to such a useful body of men as the Fire Brigade will agree with the chairman of the com-

mittee in asserting that if a stop cannot be put to this mischief it will be necessary to apply to parliament for powers to deal with it.

The engineers engaged at the Kent coal-field works near Dover are so confident of the existence of coal in paying quantities that they have just started a second colliery shaft, about two hundred feet east of the first pit. It is estimated that coal will be reached by the end of next spring. The pits are of large diameter, and will enable about eight tons of coal to be handled at one operation. The depth at which—according to the borings—coal will be touched is 1113 feet.

Every month there is issued in London an official report by the chemists attached to the various water companies and the analyst to the Local Government Board, dealing with the state of the water supplied to the Metropolis; and these reports have always been such as to give the public the greatest confidence in the purity of the water supplied to them. This confidence has lately been rudely shaken by a report issued by the London County Council, which embodies the results of both chemical and bacteriological analyses made by the foremost chemists of the day. It is clear from this report that existing methods of filtration are quite insufficient. In the case of one company, it is estimated that no less than 1145 tons of wet mud per annum escape through the filter-beds into the mains. The filters certainly retain the coarser particles of suspended matter, but a superabundance of microbes, some presumably of a dangerous character, get through, and some of them point to the imperfect filtration of sewage-polluted water. This report is the strongest argument for a new source of water-supply for the Metropolis which has yet been brought forward; in the meantime consumers can protect themselves by the use of efficient filters in their own houses.

Some months ago the railway carriages on one of our underground lines were fitted with penny-in-the-slot machines, by which an electric light could be obtained for the comfort of those wishing to read, each coin deposited insuring half-an-hour's radiance. These lamps were not sufficiently patronised to warrant their continuance, and they have now been removed. It is questionable whether a similar system applied to private houses would be better appreciated, but a lamp has been devised for the purpose which will give six hours' light for a penny. This invention has possibly been prompted by the enormous success of the penny-in-the-slot gas-meters; a success which the electric light cannot possibly attain until mains are, like the gas-pipes, run through the streets of the poorest neighbourhoods.

A consular report, dealing with the trade of Corsica for 1895, tells us that there are only three industries carried on in the island which can be deemed of any importance. At a chestnut wood at Pruno, near Bastia, gallic acid is manufactured, and at Bastia itself there is some trade in candied citron, but it has of late suffered from American competition. The remaining industry is the manufacture of (so-called) briar-wood pipes at Ajaccio. These favourite smoking implements are cut from the root of the giant heath, or 'Bruyère,' and the word has been corrupted into briar. This shrub is plentiful throughout Corsica, and there are several places on the island where sawing and

rough trimming of the wood is carried on. The pipes, roughly shaped, are exported to the Continent, where they receive their finish on the lathe.

Mr J. G. Kirtley, of Sunderland, has invented a self-adjusting pipe-joint for drains and sewers, which is a great improvement on the common method of joining up such pipes. The ends of the pipes are so constructed that when brought together there is an annular space which can be filled with any suitable cement. Such a joint, when the cement hardens, is the strongest part of the pipe, and from it leakage of liquid or gas is impossible. The patentee claims for this method of laying drain-pipes, uniformity of the alignment of bore, without the use of spun yarn; that the joints can be made without skilled labour, and with economy of cost, the addition to the price of the pipes being more than made up by the saving of labour in jointing. The invention has been favourably reported on by the Sanitary Institute of Great Britain.

The Vegetarian Society, founded at Manchester, has just held its forty-ninth annual meeting, on which occasion the chairman stated that there were three capital arguments which induced people to adopt a vegetarian diet. These were the humane argument, the economic, and the health aspects of their practice. Since the importation of cheap meat from distant parts of the world vegetarianism had not increased, a statement which was challenged by other speakers. Of late years in London many vegetarian restaurants have been established, and some of these afford daily accommodation for some hundreds of customers. A well-cooked meal of three courses for sixpence can be had at any of these places, and they doubtless attract that large class which used to lunch on bread and cheese and beer.

Some curious experiments with regard to the flotation of metals and glass upon the surface of liquids have recently been described by Professor A. M. Meyer, who attributes the power of such substances to sustain themselves on a liquid to a film of air which is condensed upon them. A ring of platinum wire $\frac{1}{16}$ of millimetre in thickness will float upon water, but if heated to redness and placed on the liquid as soon as it is cold, it will sink. Also, when withdrawn from the water and wiped dry, it will sink; but if, after drying, it be allowed to remain in the air for about fifteen minutes, it will again float. Also, after heating to redness, it remains in the air for half-an-hour, it will float. A glass rod drawn out in a spirit flame until it is only one millimetre in thickness will behave in the same way as platinum wire, provided that the length is not more than about five centimetres.

A novel method of preserving oysters, clams, &c., has recently been patented in Philadelphia. The aim of this invention is to compel the bivalves to which it is applied to retain their natural juices, so that, when required for use, they may be found in a fresh state. For this purpose the shells are rigidly fastened together by small plugs of wood, which are driven through the outer edges at the opposite side to the hinge of the shell. The wooden plug is driven through perforations made for its reception, and as it quickly swells with the moisture, it is firmly held in position, and the oyster is hermetically sealed,

until the edge of the shell is broken previous to the insertion of the fishmonger's knife.

Professor Scripture has lately recorded some curious results obtained in a series of experiments which were intended to show that hallucinations can be measured. First with regard to hearing. The person experimented with was placed in a quiet room, and was told that a telegraph-sounder there whenever it clicked would be accompanied by a faint tone of sound, which would every time increase in intensity. Every time he heard the tone he was to touch a telegraph key, so that the operator in a distant room who originated the sounds would know that the apparatus was working satisfactorily. After the first few occasions it was sufficient to work the sounder only, the person experimented with being firmly convinced that he yet heard the extra tone as well. Experiments of a similar nature were made on other senses. For example, a metronome was set in action, and at each recurrent beat a pith-ball was dropped on the back of the patient's hand; but after a few times the ball was not used, the patient feeling its touch all the same by pure hallucination. It was found that the taste could be deceived with equal success. By dropping on a patient's tongue a solution of sugar and water, followed by pure water, the sugar was still apparent to the man, although no sugar was there. Experiments with the organs of hearing and sight gave much the same results, showing at least that this deception of the senses, called hallucination, is a thing which must be recognised and allowed for. It must be noted that the persons who offered themselves for experiment were perfectly sane, and were not drawn from any one class; nor did they know the purport of the experiments, further than that they were to undergo certain tests for sensation. Professor Scripture believes that the experiments may be valuable in their application to mental pathology, and also as a beginning to the scientific treatment of hypnotism and suggestion.

Dr Baldwin of Columbus, writing to the *Scientific American*, protests against the apparently authenticated reports, which from time to time make their appearance in the press, of persons being buried alive, and he asserts that there is little doubt 'that these newspaper yarns are, without exception, pure and simple fabrications, without the slightest real foundation in fact.' He points out that with our ordinary method of sepulture burial alive is an actual impossibility, for even supposing that a supposed dead person were in a trance, he must die from suffocation by closure of the coffin long before the grave could be reached. He in common with his medical friends have for some years taken the trouble to sift all cases of the kind which were reported in the local papers, and in not a single instance have any of the cases investigated been found to have any foundation in fact. One case of alleged suspended animation he gives at length, and proceeds to describe how it was found to be, from beginning to end, a piece of pure invention on the part of some mendacious scribe. Some good people have such a horrible dread of premature burial that this investigation by Dr Baldwin may prove of considerable value in allaying their fears.

What is erroneously called 'The New Photography' still forms the subject of innumerable

communications to the newspapers, and reports of what the famous X-rays will or will not do are many in number. One of these states that the continued action of these radiations upon the flesh gives rise to very painful results, in one case an experimenter who had worked the Röntgen apparatus for some weeks finding his hand covered with sores and his nails dropping away from his fingers. We have heard of two or three similar cases, and have no reason to doubt the truth of the report in question. Possibly good may eventually come from evil, and the rays be found to exert a beneficial action in cases of obstinate skin disease. We may note that the distressing symptoms alluded to only make their appearance after a very long use of the Röntgen apparatus, an occasional application being quite harmless.

Mr Richard Brown, secretary of the Edinburgh Society of Accountants, calls attention to what was quite an unintentional act of injustice on the part of the writer of 'Accountancy' in last month's *Journal* towards the Scottish societies. It appears that royal charters, incorporating the Scottish societies, were granted a long time before those for England (1880), as mentioned in the article. The Edinburgh society received its charter in 1854, the Glasgow society in 1855, and that of Aberdeen in 1867. It will thus be seen that the profession of accountant is of much older standing in Scotland than in England. In this

connection the official directory of Scottish accountants has just been published, and proves how thoroughly organised the Scottish societies have now become.

T I M E.

TIME the Revealer ! Lo ! he passeth by,
Flashing his torch upon the buried year ;
As writing hidden long from mortal eye
Before the flame starts forth in letters clear ;
So shall the story of our past be seen,
So must we look at last on what hath been.

TIME the Avenger ! bringing forth to view
Mistake and folly—bitter word and deed,
How here we failed a friend, or proved untrue,
To one who leaned, and found—a broken reed ;
What we have written ne'er can we efface,
Or change one word, one letter from its place.

TIME the Consoler ! showing us at last
Whose hand has set the lesson of our years ;
A line of purpose through the blotted past
In that new vision suddenly appears ;
And past and present, linked in one, grow plain—
Life's lessons never seem so hard again.

MARY GORGES.

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